

Space Science Advisory Committee (SScAC) Report
July 28 – 30, 2004
San Diego CA.

Mr. Al Diaz
AA Science Mission Directorate
NASA
Washington D.C.

Sept 25, 2004

Dear Mr. Diaz:

The Space Science Advisory Committee met July 28-30, 2004 on Shelter Island in San Diego, CA immediately following a series of joint meetings of the Origins, Structure and Evolution of the Universe, Sun-Earth Connection and Solar System Exploration subcommittees. We were pleased with our conversations with Ed Weiler the former Associate Administrator and with you and with members of your staff. These discussions were open and far-ranging, as expected with the dramatic changes occurring within NASA and in particular the former Office of Space Science (OSS).

A major activity at our meeting was consideration of the GPRA (Government Performance Requirements Act) report for the year. As in previous years, we were impressed with the record and would like to commend the former Office of Space Science for a remarkable year of scientific accomplishments. Across the spectrum, from small missions to large observatories, from the Earth and its environs through the solar system out to the largest scales in the universe, NASA science programs have revealed stunning insights. With the launch of the Spitzer observatory, we now have a suite of remarkably powerful Great Observatories in simultaneous operation. As with Chandra and HST, Spitzer is again demonstrating how such observatories enable exploration of the universe to the delight of both scientists and the nation at large. The Mars Rovers and the scientific evidence for past standing bodies of water on the Martian surface have captivated the public's imagination and continue to return great scientific data that will be a resource for the science community for years to come. The dramatic arrival of Cassini at its destination heralded the start of the acquisition of new images and data on a majestic object in our outer system that will provide forefront scientific results. The suite of solar, heliospheric and geospace satellites have provided new understanding of the role of the Sun and heliosphere in space weather and global change as well as sparked public interest with dramatic and detailed pictures of solar eruptions and their complex effects (such as aurorae) at Earth.

The OSS Public Affairs program has been very successful at keeping NASA Space Science highly visible to the public. The public interest in many NASA missions is a

continuing demonstration of the innate curiosity of the American people for insights into our universe. Public and congressional support for space science owes much to the superb job done by the Office of Space Science to involve the media in our accomplishments, as was dramatically illustrated in Ed's report showing that 79% of NASA's Science News Metrics were based on space science.

We were encouraged that the President's Commission on Implementation of United States Space Exploration Policy (the Aldridge Commission) identified three Exploration Themes that map directly into the OSS research strategy. These go to the heart of some of the most fundamental questions: our origins, how the universe evolved and what is its fate. We hope that the agency explicitly recognizes the value to the nation of NASA's **scientific** heritage in its formulation of national high-level goals and mission objectives.

The committee wishes to thank Anne Kinney, Orlando Figueroa, Richard Fisher, Paul Hertz, and Philip Sakimoto for their high quality, informative and concise presentations. We would especially like to thank Dr. Michael Malin, President of Malin Space Science Systems, for his fascinating lunch-hour presentation on the Mars Rover scientific results.

It has been our great pleasure and honor to assist Ed Weiler during his tenure as Associate Administrator of the Office of Space Science. We have been privileged to participate in times of stress and jubilation in space science from a vantage point enjoyed by few. We wish him all the best as he leaves headquarters to serve NASA in a new role.

We look forward to supporting you in your new role and to the continued success of the space science endeavor and NASA.

Sincerely

Andrew B. Christensen
Chair, Space Science Advisory Committee

Attachments:
SESS meeting report
SECAS meeting report
OS meeting report

Recommendations and Findings

The Role of Science in the new NASA

Space science must have a central role in the U.S. space exploration program. Clearly, the space sciences program at NASA has been extremely successful scientifically and has certainly captured the public interest. NASA's astrophysical observations, for example, are revolutionizing our concepts of the universe from black holes to dark energy while the exciting new scientific discoveries of the Mars missions are rewriting the history of the planet. Moreover, science is a prime element in the public's positive image of NASA: 9 billion web site hits during the Mars Rover operations are but one impressive measure of the extent to which NASA's scientific achievements have excited the public imagination.

The momentum of the scientific enterprise must not be lost as NASA reorganizes to meet the challenges of the Exploration Initiative. The new exploration program must recognize the value of a healthy science program and its role in sustaining public interest through such a long duration project.

Manned exploration of the moon and Mars needs a strong scientific imperative and rationale if it is to be more than expensive tourism. The present space science program is well aligned with the exploration themes highlighted by the Aldridge Commission: Origins, Evolution and Fate. Continued support of space science will invigorate, enliven and sustain the Exploration Initiative.

- 1. SScAC recommends NASA emphasize the role of science in the exploration program and apply the power of scientific discovery to inspire, guide, lead, and sustain the U.S space exploration program, ensuring that its essential goals – including the advancement of scientific knowledge – are met.**
- 2. SScAC also recommends that the science goals related to origins, evolution, and fate of the universe including the Sun –Earth system be integrated into the highest level agency requirements and goals.**

James Webb Space Telescope (JWST)

The James Webb Space Telescope, the top priority in the Astronomy Decadal Survey and a vital tool in our efforts to explore the universe, is facing a significant financial and schedule risk. As part of its contribution to the construction and launch of JWST, ESA has agreed to provide an Ariane V launch at no cost to NASA. Unfortunately, the National Security Advisor and the Office of Science and Technology Policy (OSTP) have not yet approved this launch plan. If the plan is not approved within the next few months,

there will be major risks to JWST's schedule. Moreover, if this launch plan is discarded, the cost of JWST will grow significantly and NASA's relationship with ESA will be damaged at a time when (according to the Aldridge Commission report) international cooperation is very important for the success of the Space Exploration Initiative.

SScAC supports the efforts of the Science Mission Directorate (SMD) to pursue the interagency approval process and make this launch approval a high priority.

Outer Solar System

The outer planets program comprises two missions at this time, New Horizons and the Jupiter Icy Moons Orbiter (JIMO). The New Horizons mission will provide the first exploration of the outermost bodies of the solar system, particularly their volatile and organic components, and addresses two of the four central themes highlighted in the 2003 Planetary Decadal Survey. The launch of New Horizons in 2006 is threatened by the indefinite stand-down of all activities at Los Alamos National Laboratory, where packaging for radioisotope thermoelectric generators (RTGs) is ongoing, and by the launch vehicle certification schedule. The science lost by delaying launch until 2007 is considerable—no Jupiter flyby and several years delay of the Pluto-Charon and Kuiper Belt Object flybys. NASA is commended for its efforts to complete and develop New Horizons, against obstacles that are to some extent out of its control. **However, this crisis illustrates the need to find alternate sources for fuel packaging of RTGs and other critical path items for outer solar system missions.**

Current funding profiles and technology development for the JIMO mission will permit a launch not earlier than 2015, with an arrival at Europa in 2022 or 2023. This is close to the end of the Decadal Survey planning horizon and represents a significant slip from the plans presented last year.

SScAC recommends that NASA give high priority to completing and launching JIMO under Project Prometheus, to ensure a viable outer solar system program and that Project Prometheus technology will be available in a timely fashion for other space science missions requiring in-space propulsion and high power levels. We continue to stress that the coordination of science requirements and technical developments in the JIMO project is of paramount importance for success.

Advanced Technology

SScAC has expressed a long-term interest in the formulation and execution of a well-integrated advanced technology roadmap and budget. Our concerns have focused on the need for an appropriate planning process and procedures that ensure adequate funding of advanced technologies directly linked to scientific mission requirements.

SScAC offers the following recommendations as you put the Science Mission Directorate into place.

1. **Formulate, implement, and update an integrated science technology plan through a process that coordinates the Science Mission Directorate, The Exploration Systems Mission Directorate and the Advanced Planning and Integration Office. This planning process could be integrated with the capabilities assessments being compiled for the Director of Advanced Planning.**
2. **Identify in the FY 2006 budget of the Science Mission Directorate separate line items for (a) crosscutting technologies and (b) mission-focused technologies.**
3. **Establish a senior staff position focused on advanced technology.**

Suborbital Program

The suborbital program has served the needs of the nation for decades. However, despite strong support from the user community in general and NASA's advisory structure in particular, the program has not met user needs in recent years and the prognosis is very bleak. The large decrease to the sounding rocket portion of the program proposed in the President's FY05 budget has resulted in the untimely cancellation of an approved science investigation. Furthermore a plan calling for future cut backs will greatly compromise the value of the program for the space science community. **This recognition leads SScAC to endorse the plans to conduct a zero-based review of the suborbital program.** The committee further desires that the review result in a plan that will allow the needs of the program's main customer, the Science Mission Directorate, to be met in the best possible manner. These needs include science excellence and fiscal responsibility. In this context science excellence refers not only to the science performed directly by suborbital missions, but also training of scientists and development of technology.

Education and Public Outreach

The E/PO efforts within the Office of Space Science have been a great success due in part to outstanding leadership and the strong support of SScAC. As pointed out by the SScAC E/PO Task Force, the *direct* involvement of space scientists in the E/PO activities has been critical to its success. Because these key scientists are uniquely capable of communicating the excitement and discoveries from space science missions and research programs, keeping them intimately and personally involved in the E/PO activities is of the utmost importance. We are particularly concerned that the reassignment of key E/PO managerial positions from beneath the purview of former OSS and the growing difficulty of recruitment of E/PO IPAs, because they will not now be working within the Space Sciences Directorate, could lead to deterioration in the quality of the program.

The SScAC has strongly supported Space Science E/PO efforts, including requiring that a committee member specifically represent the interests of the education community and act as a liaison with the NASA Education Advisory Committee.

SScAC also notes that the former OSS policy of mandating a small fraction of its funding for E/PO has transformed both the way E/PO is done, and how E/PO is perceived. Space Science E/PO has become an intimate facet of each and every Space Science mission and program. This is arguably one reason that Space Science has been the most visible and successful division of NASA. The combination of Space- and Earth-science E/PO activities under one Science Mission Directorate umbrella is an opportunity to merge successful policies and activities.

SScAC recommends:

- 1. The Science Mission Directorate should continue to carry out a robust E/PO program.**
- 2. The Science Mission Directorate should continue the OSS policy that at least 1 percent of the budget of each new SMD mission and program be devoted to E/PO activities.**
- 3. The Science Mission Directorate should look to the demonstrably successful Space Science E/PO program as a model from which to proceed with its combined E/PO activities in the future.**
- 4. In the Science Mission Directorate advisory structure, at least one member should be included who is an advocate for and representative of the E/PO community, as is the current policy for SScAC.**

Explorer Program

For nearly 50 years, the Explorer Program has consistently yielded scientific triumphs for NASA. The remarkable discoveries made by WMAP, TRACE, GALEX, IMAGE, RXTE, and RHESSI, for example, have made international headlines by triggering fundamental breakthroughs in understanding our entire universe, from Earth's auroral displays to the earliest echoes of the Big Bang. The Explorer program provides irreplaceable benefits beyond its scientific harvest, including the advancement in space technology and the professional training and advancement of scientists, engineers, and managers needed for a robust and healthy national space enterprise. The budget cuts imposed recently on this highly productive and cost-effective component of the Science Directorate endanger its future scientific and technological advances, and leave a significant gap in the Directorate's carefully planned mix of mission sizes and scopes.

SScAC strongly recommends that the Science Directorate restore and maintain a healthy level of funding for the Explorer Program.

Terrestrial Planet Finder

The Origins Subcommittee reported on NASA's decision to pursue two separate, sequential Terrestrial Planet Finder (TPF) missions: TPF-C (a coronagraph) and TPF-I (an interferometer). This is potentially an important advance for TPF, and represents a major milestone, as well as a significant change in scope of the mission. It is likely that each of these missions will be comparable to or larger than JWST in cost. Because this is a major step forward for one of our key astrophysical missions, and may have an impact on other parts of the science program, **SScAC requests a briefing from the project at its next meeting so as to better understand the technical advances and other factors that led to the decision, as well as the scope and requirements for the two missions.**